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(57) Combination of 6-methyl-1,2,3-oxathiazin-4(3H)-one-2,2-dioxide (acesulfame) with 3-(L-aspartyl-D-alaninamido)-2,2,4,4-tetramethylthietane masks the bitter taste of the oxathiazine and at the same time provides synergistic sweetness over a range of concentrations.

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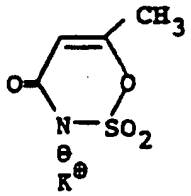
SYNERGISTIC SWEETENING COMPOSITIONS

6-Methyl-1,2,3-oxathiazin-4(3H)-one-2,2-dioxide (or an edible cationic salt thereof), conveniently used in the form of its potassium salt (generic name: acesulfame potassium salt), of the formula



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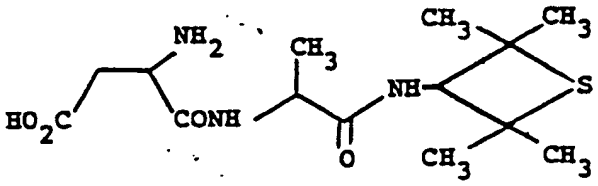
in combination with 3-(L-aspartyl-D-alaninamido)-2,2,4,4-tetramethylthietane of the formula



or an edible salt thereof, provides a combination wherein the bitter aftertaste of acesulfame is masked. At the same time, over a range of concentrations, the combination demonstrates synergism whereby the sweetening power of the combination is greater than its component parts.

Acesulfame, including its potassium salt (hereinafter abbreviated as AS-K), has been described by Clauss et al., U.S. Patent 3,689,486 (1972), as an artificial sweetening agent having a sweetness of 130 relative to cane sugar in water at concentrations equivalent in sweetness to a 4% solution of said cane sugar. Such solutions were further indicated to be free of objectionable bitter taste at the specified concentration (0.031%) equivalent to 4% cane sugar [Clauss et al., Angew. Chemie. Inter. Ed. in English 12 (11), pp. 869-876 (1973)]. However, at concentrations equivalent to 6-10% sucrose, the relative sweetness of AS-K is about 90 or less. Moreover, at concentrations above 6% sucrose equivalent, the bitter chemical taste of AS-K becomes objectionable. Thus its use in edible foods and beverages, in oral hygienic products and in medicinal agents formulated for oral use is greatly limited, since concentrations equivalent to the sweetness of 10% sucrose or better are frequently desirable in such uses.

3-(L-Aspartyl-D-alaninamido)-2,2,4,4-tetramethylthietane, hereinafter called CP-54,802, has been described as a synthetic sweetening agent in European Patent Document No. 34,876, published in 1981. The isolation and purification of this compound in the form of various of its aromatic sulfonate salts has also been described by Sklavounos, U.S. Patent 4,375,430 (March, 1983).

Subsequent to our invention, there has been a news report, unsupported by scientific data, that AS-K is synergistic with aspartame (the methyl ester of L-aspartyl-L-phenylalanine); see Beverage World, April 1983, page 48. There are no known reports concerning the bitter aftertaste of AS-K at higher concentrations, or of methods to overcome that bitter aftertaste.

The present invention encompasses a method of masking the bitter taste and enhancing the sweet taste of 6-methyl-1,2,3-oxathiazin-4(3H)-one-2,2-dioxide, or an edible cationic salt thereof, in a composition for oral use which comprises combining in said composition 0.5 to 20 parts by weight of 3-(L-aspartyl-D-alanamido)-2,2,4,4-tetramethylthietane or an edible salt thereof for each 99.5 to 80 parts by weight of said oxathiazine or salt thereof, the sum of the parts by weight equalling 100, in total amounts which produce the desired sweetness in said composition, as hereinafter defined.

The present invention also encompasses such artificially sweetened oral compositions, and a composition suitable for use in the manufacture of such oral compositions.

Conveniently, acesulfame is used as its potassium salt (AS-K), and CP-54,802 in free base form, but it will be understood by those skilled in the art that alternative cationic or acid addition salt forms of these substances can be used, and that the actual form of acesulfame and CP-54,802 in a composition for oral will be dependent upon the pH of the composition and the nature of the cationic and anionic substances present therein.

The present method is particularly valuable when a concentration of sweetening agent equivalent to 6% sucrose or higher is required. Such compositions for oral use include, but are not limited to, foods or beverages (e.g., a gelatin dessert or pudding, or dry-mix therefor, a confection or chewing gum, a flavored carbonated drink, a fruit flavored non-carbonated drink or dry-mix therefor, a canned or preserved fruit or fruit juice, or a baked product such as a cake or cookie), a solution or dry powder for use as a table sweetener (i.e. for sweetening edible foods and beverages at the point of consumption), oral hygienic products (such as mouth wash, tooth paste and tooth powder) and formulated medicinal agents (particularly solutions or suspensions for pediatric use).

The relative sweetness intensity and quality of CP-54,802, AS-K and mixtures of CP-54,802 and AS-K were determined by sensory analysis. These determinations were carried out in a facility designed for controlled tasting, flavor research and evaluation of food additives, including a separate preparation room and individual tasting booths with complete air-conditioning, controlled lighting, running water and a sink for expectoration.

Aqueous solutions of sucrose were prepared at concentrations (w/w) of 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12% along with a sample of one of the test compounds at the levels specified in the test experiments. A beaker containing a solution of the test compound identified only by a coded digit was submitted to the taster by a co-worker along with a beaker containing the above sucrose solutions. The sweetness intensity of the test compound was compared with one or more of the sucrose control solutions to determine whether that particular sucrose reference sample was of lesser, greater or equal sweetness. The taste quality of the test sample was then characterized by comparison with the sucrose solution. In some instances a reference aqueous solution containing either CP-54,802 and/or AS-K alone was also used to characterize the taste quality of mixture of CP-54,802 and AS-K.

According to the procedure detailed above, a sample of AS-K was carefully reevaluated, confirming its high equivalence to sucrose and lack of bitter aftertaste at concentrations equivalent to less than 6% sucrose. After selecting the particular sucrose solution equal in sweetness to the AS-K solution, subsequent test comparisons of the AS-K and sucrose solution at closest sweetness intensity were performed to recheck the intensity value and to characterize the taste quality of the AS-K. By this means, the following results were obtained:

Concentration Sucrose %	Equivalent Concentration AS-K %	AS-K Potency Sucrose = 1
2	0.0080	250
3	0.0150	200
4	0.0250	160
5	0.0455	110
6	0.0667	90
7	0.0777	90
8	0.0889	90
9	0.1059	85
10	0.1250	80

We have further determined that AS-K solutions exhibit an undesirable bitter taste quality at concentrations above a concentration equal in sweetness to 6% sucrose. This made the estimation of its relative sweetness difficult to assess, such that the given potency values above 6% sucrose equivalents can only be approximate.

When tested in like manner, CP-54,802 demonstrated a more nearly linear relationship between concentration and sucrose equivalence:

Concentration Sucrose %	Equivalent Concentration CP-54,802 %	CP-54,802 Potency Sucrose = 1
2	0.00069	2,900
3	0.00105	2,850
4	0.00143	2,800
5	0.00200	2,500
6	0.00260	2,300
7	0.00310	2,250
8	0.00378	2,112
9	0.00430	2,075
10	0.00500	2,000

All the solutions exhibited a clean, sugar-like taste quality with a slightly slow onset of sweetness.

By these methods, the enhanced sweetness potency and the reduced AS-K bitter aftertaste found in combinations of AS-K with CP-54,802 were determined. Test results are summarized in Table I.

Table I

Sweetness Potency and Taste Quality of Mixtures of CP-54,802 and Acesulfame K Containing 0.5% to 20% CP-54,802 When Compared to 10% Sucrose in Water

mposition -54,802/ AS-K	Concentration (g/100 ml) = 10% Sucrose	Potency of Mixture	Predicted Potency[a]	% Synergism	Taste Quality
0/100	0.1250	80	-	-	Sweet, followed by a moderate to strong bitter metallic note, followed by a sweet and bitter lingering taste.
5/99.5	0.0877	114	104 (2950/90)	9	Sweet, followed by a slight-moderate bitter note, followed by sweetness. Bitterness has a clean cutoff.
1/99	0.0775	129	118 (2890/90)	9	Sweet, followed by a slight bitter note, followed by sweetness. Bitterness has a clean cutoff. The degree of bitterness is in the slight magnitude.
2/98	0.0538	186	153 (2850/100)	21	Sweet, followed by a slight bitter note, followed by sweetness. Bitterness has a clean cutoff. The degree of bitterness is in the perceptible-slight magnitude.
4/96	0.0398	251	228 (2700/125)	10	Sweet, followed by a very slight bitter note, followed by sweetness. Bitterness has a clean cutoff. The degree of bitterness is in the perceptible magnitude.

Table I. Continued

Composition CP-54,802/ AS-K	Concentration (g/100 ml) ≡ 10% Sucrose	Potency of Mixture	Predicted Potency[a]	Synergism	Taste Quality	
6/94	0.0305	328	295 (2575/150)	11	Clean sweet taste of sugar.	No trace of bitterness.
8/92	0.0235	425	358 (2725/170)	19	Clean sweet taste of sugar.	No trace of bitterness,
10/90	0.0200	500	436 (2500/185)	15	Clean sweet taste of sugar, onset sweetness perception.	Slow
12/88	0.0174	574	473 (2475/200)	21	Clean sweet taste of sugar, onset sweetness perception.	Slow
14/86	0.0152	654	529 (2460/215)	24	Clean sweet taste of sugar, onset sweetness perception.	Slow
16/84	0.0143	700	573 (2400/225)	22	Clean sweet taste of sugar, onset sweetness perception.	Slow
18/82	0.0137	729	611 (2350/230)	19	Clean sweet taste of sugar, onset sweetness perception.	Slow
20/80	0.0133	751	643 (2275/235)	17	Clean sweet taste of sugar, onset sweetness perception.	Slow

[a] Predicted potency = $\left(\frac{\%\ \text{CP-54,802}}{100} \times \text{Potency at concentration of CP-54,802}\right) + \left(\frac{\%\ \text{AS-K}}{100} \times \text{Potency at concentration of AS-K}\right)$

The potency at various concentrations of (CP-54,802/AS-K) is shown in parenthesis. It was determined by interpolation of the data herein showing potency versus concentration for each component.

The combinations of the present invention provide advantageous sweetening agents, in view of their high potency, their physical form and stability, and lack of harsh or bitter aftertaste at ordinary use levels. The components of the combinations can be employed separately - in solid forms such as powders, tablets, granules and dragees; and liquid forms such as solutions, suspensions, syrups, emulsions as well as other commonly employed forms particularly suited for combination with edible or pharmaceutical materials. These forms can consist of each individual component, alone, or in association with non-toxic sweetening agent carriers, i.e. non-toxic substances commonly employed in association with sweetening agents. Such suitable carriers include water, sorbitol, mannitol, vegetable or mineral oils, corn syrup solids, lactose, cellulose, starch, dextrins, modified starches, polysaccharides such as polydextrose (see, e.g. U.S. 3,766,165 and U.S. 3,876,794), calcium phosphate (mono-, di- or tri-basic) and calcium sulfate.

Alternatively, particularly for use as a table sweetener or in the manufacture of edible or pharmaceutical materials, the components of the combinations are preblended and then used in solid or liquid forms as detailed in the preceding paragraph.

The ultimate compositions for edible use, or for use as oral hygienic products or as formulated medicinal agents, are readily prepared, using methods generally known in the food technology and pharmaceutical arts. The taste quality of such typically prepared edible products prepared with sucrose, with AS-K alone and with one of present combinations as sweetening agent are summarized in Table III.

Table III

Taste Quality of Various Edible Products Sweetened with Sucrose, AS-K Alone or a Combination of AS-K with CP-54,802

Edible Product	Sweetening Agent	Use Level of Agent in Product as Consumed(%)	Potency of Sweetening Agent in Product	Taste Quality
la frozen dessert	Sucrose	15	(1)	Very good clean sweet taste quality.
	AS-K	0.167	<90	Significantly less sweet than sucrose and CP-54,802/AS-K mixture. Product exhibited a moderate intensity of bitterness.
	8% CP-54,802 92% AS-K	0.033	455	Comparable in quality and sweetness intensity to the sucrose dessert.
ermint hard candy	Sucrose	97	(1)	Very good clean sweet taste quality.
	AS-K	1.07	<90	Significantly less sweet than sucrose and CP-54,802/AS-K mixture. Candy displayed a moderate intensity of bitterness.
	6% CP-54,802 94% AS-K	0.298	326	Good sweetness impact with perceptible bitter notes.

)le III. Continued

Edible Product	Sweetening Agent	Use Level of Agent in Product as Consumed(%)	Potency of Sweetening Agent in Product	Taste Quality
Vanilla cakes	Sucrose	30	(1)	Very good clean sweet taste quality.
	AS-K	0.330	90	Sweet with pronounced bitterness.
	6% CP-54,802 94% AS-K	0.100	300	Good sweetness impact with perceptible bitter notes.
Vanilla pudding	Sucrose	14.2	(1)	Very good clean sweet taste quality.
	AS-K	0.156	<90	Not as sweet as the sucrose and CP-54,802/AS-K mixtures. Pudding was judged to have a moderate to pronounced bitterness.
	1% CP-54,802 99% AS-K	0.110	129	Sweet with perceptible to slight bitterness.
	4% CP-54,802 96% AS-K	0.056	254	Good sweetness impact, with a sugar-like quality.
	8% CP-54,802 92% AS-K	0.033	430	Comparable in quality to the sucrose pudding.
	12% CP-54,802 88% AS-K	0.024	592	Comparable in quality to the sucrose pudding.
	16% CP-54,802 84% AS-K	0.019	747	Comparable in quality to the sucrose pudding.
	20% CP-54,802 80% AS-K	0.015	947	Comparable in quality to the sucrose pudding.

II. Continued

dible Product	Sweetening Agent	Use Level of Agent in Product as Consumed(%)	Potency of Sweetening Agent in Product	Taste Quality
emonade drink	Sucrose	7.4	(1)	Very good clean sweet taste quality.
	AS-K	0.082	<90	Less sweet than the sucrose and CP-54,802/AS-K mixtures. Drink displayed a moderate bitter taste quality.
	6% CP-54,802 94% AS-K	0.023	322	Sweet with perceptible/slight bitterness.
	8% CP-54,802 92% AS-K	0.018	411	Sweet with perceptible bitterness.
	10% CP-54,802 90% AS-K	0.015	493	Good sweetness impact with a sugar-like quality.
	14% CP-54,802 86% AS-K	0.011	673	Comparable in quality to the sucrose lemonade.
ype carbonated drink	Sucrose	11.0	(1)	Very good clean sweet taste quality.
	AS-K	0.121	<90	Not as sweet as the sucrose and CP-54,802/AS-K blends. Sample exhibited slight to moderate bitterness.
	2% CP-54,802 98% AS-K	0.059	186	Good sweetness impact with a sugar-like taste(i.e, free of bitterness)
	4% CP-54,802 96% AS-K	0.044	250	Comparable in quality to the sucrose beverage.

le III, Continued

Edible Product	Sweetening Agent	Use Level of Agent in Product as Consumed(%)	Potency of Sweetening Agent in Product	Taste Quality
Cola carbonated drink	Sucrose	12.0	(1)	Very good clean sweet taste quality.
	AS-K	0.133	90	Not as sweet as the sucrose and CP-54,802/AS-K mixtures. Sample displayed a slight to moderate bitterness.
	1% CP-54,802 99% AS-K	0.100	120	Sweet with a perceptible bitter taste quality.
	2% CP-54,802 98% AS-K	0.065	184	Good sweetness impact, with a sugar-like quality.
	4% CP-54,802 96% AS-K	0.048	251	Comparable in quality to the sucrose beverage.
	6% CP-54,802 94% AS-K	0.032	324	Similar taste as the mixture containing 4% CP-54,802.
Strawberry drink	Sucrose	10.0	(1)	Very good clean sweet taste quality.
	AS-K	0.111	<90	Not as sweet as the sucrose and CP-54,802/AS-K blends. Drink elicited a moderate to pronounced bitterness.
	1% CP-54,802 99% AS-K	0.083	120	Sweet with perceptible to slight bitterness.
	4% CP-54,802 96% AS-K	0.040	250	Sweet with perceptible bitter notes.
	6% CP-54,802 94% AS-K	0.030	333	Good sweetness impact, with a sugar-like quality.

le III. Continued

Edible Product	Sweetening Agent	Use Level of Agent in Product as Consumed(%)	Potency of Sweetening Agent in Product	Taste Quality
range gelatin dessert	-	14.0	(1)	Very good clean sweet taste quality.
	-	0.156	<90	Slightly less sweet than the sucrose and CP-54,802/AS-K mixtures. Product exhibited moderate bitter notes.
	4% CP-54,802 96% AS-K	0.056	250	Sweet with perceptible to slight bitterness.
	6% CP-54,802 94% AS-K	0.043	325	Good sweetness impact with a sugar-like quality.
	8% CP-54,802 92% AS-K	0.033	424	Comparable in quality to the sucrose gelatin.

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The following Examples are illustrative. However, it should be understood that the invention is not limited to the specific details of these Examples.

EXAMPLE 1

Chewing Gum

Chewing gums were prepared using either corn syrup and confectionary sugar (sucrose) or a mixture containing 10% CP-54,802 and 90% AS-K as the sweetener components. The following ingredients and method were used.

Chewing Gum No.	(1) (Control)	(2)
Ingredients	Weight %	Weight %
Gum base (Paloja)	20.00	20.00
Confectionary sugar	56.86	-
Corn syrup (80% soluble solids)	19.93	-
Polydextrose	-	36.22
Sodium bicarbonate	-	0.36
Crystalline sorbitol	-	36.12
Water	-	3.99
CP-54,802	-	0.01
AS-K	-	0.09
Glycerin	0.61	0.61
Peppermint oil	0.60	0.60
Confectionary sugar for dusting	2.00	-
Mannitol for dusting	-	2.00
	100.00	100.00

Procedures:

(1) Sugar Chewing Gum. The gum base was ground to 150-250 microns. Confectionary sugar was added with thorough mixing, the mixture transferred to a stainless steel beaker, placed in an oil bath

(set at 80°C) and allowed to soften while stirring at 250 rpm. The corn syrup was added and stirring continued for 10 minutes to obtain a homogeneous mixture. The glycerin and peppermint oil were combined and added with stirring to the molten gum/sugar mixture and again stirred for 10-12 mintues to obtain a homogeneous mix. The chewing gum mass was transferred onto a marble slab which had been dusted with confectionary sugar, introducing some of the dusting sugar to the mass, and kneaded, until a smooth non-sticky and non-stringy mass was obtained. The mass was flattened to 1/16 inch thickness, cut into the desired size and wrapped.

(2) Artificially Sweetened Chewing Gum. Same procedure as 1, except prior to the gum preparation the polydextrose, sodium bicarbonate and sorbitol were premixed and micronized in a mill to about 10 micron particle size. The resulting microfine mixture was added to the gum in the same manner as the confectionary sugar. Furthermore, the CP-54,802 and AS-K mixture was dissolved in water and combined with glycerin and peppermint oil, and the mannitol was used for dusting powder in place of the confectionary sugar in the dusting step.

Taste comparison of the two chewing gums indicated them to be essentially equivalent in sweeteness intensity, texture, color and other overall flavor characteristics. Based on these results the mixture containing 10% CP-54,802 and 90% AS-K exhibited a sweetness potency of approximately 500 times that of confectionary sugar.

EXAMPLE 2

Chewing Gum

A synthetically sweetened chewing gum was prepared according to the preceding Example, utilizing 0.19% of a blend composed of 4% CP-54,802 and 96% AS-K in place of the 0.1% of the mixture containing 10% CP-54,802 and 90% AS-K. When compared to the control chewing gum of the preceding Example, the resultant product displayed sweetness intensity and quality similar to the sugar control. Based on this observation the 4% CP-54,802 and 96% AS-K mixture provided a sweetness potency of about 250 times that of sugar.

EXAMPLE 3

Table Seetener (Solid)

A table sweetener containing a mixture of 0.5% CP-54,802 and 99.5% of AS-K was prepared according to the following ingredients proportion and directions:

Ingredients	Weight %
CP-54,802	0.05
AS-K	9.95
Hydrolyzed cereal solid 5DE	90.00
	100.00

A 0.44 gram portion of this composition provided sweetness equivalent to a teaspoon of sucrose (i.e. 5 grams).

EXAMPLE 4

Table Sweetener (Liquid)

A table sweetener in a liquid form containing a blend of 12% CP-54,802 and 88% AS-K was prepared as follows:

Ingredients	Weight %
CP-54,802	0.02
AS-K	0.15
Sodium benzoate	0.10
Water	99.73
	100.00

A teaspoon (5 grams) of this table sweetener gave sweetness comparable to 5 grams (a teaspoon) of granulated sugar.

EXAMPLE 5

Pancake Syrup

The following pancake syrup compositions were found functionally equivalent from the standpoint of sweetness intensity and quality.

Ingredients	Weight %	Weight %
Sucrose	50.00	-
Polydextrose	-	50.00
Sodium bicarbonate	-	0.50
Artificial sweetener mixture composed of 8% CP-54,802 and 92% AS-K	-	0.12
Water	49.62	49.00
Sodium benzoate	0.10	0.10
Maple flavor	0.10	0.10
Acid proof caramel color 10% aqueous solution	0.18	0.18
	100.00	100.00

EXAMPLE 6

Canned Peaches

Fresh peaches were washed, peeled, pitted and sliced and then immersed in an aqueous solution containing 0.05% ascorbic acid to prevent oxidase darkening. The sliced peaches were packed into 1/2 pint screw cap jars and filled to the top with a syrup containing 20% polydextrose, 0.077% of a blend containing 14% CP-54,802 and 86% AS-K and 0.1% citric acid. The jars were subsequently capped loosely and placed in a home canning autoclave containing hot water (approximately 1.5 inches below tops of jars) and heated at 100°C for 45 minutes. The jars were removed and immediately sealed by tightening caps and allowed to cool by immersing in cold water.

Sensory evaluations indicated the canned peaches to be comparable in sweetness intensity and quality to similar canned peaches containing 50% sucrose.

EXAMPLE 7

Strawberry Preserve

The following dietetic strawberry preserve containing a mixture of 20% CP-54,802 and 80% AS-K was found to be comparable in sweetness intensity to a similar preserve containing 48% sucrose.

Ingredients		Weight %
Polydextrose		40.130
Sodium bicarbonate		0.400
Water		17.380
Low methoxyl pectin		1.290
Calcium chloride 10% aqueous solution		0.690
Strawberry fruit		34.500
Citric acid 50% aqueous solution		1.120
CP-54,802	Combine and	0.013
AS-K	dissolve solids	0.051
Water	in water	4.426
		100.000

Procedure:

The polydextrose, sodium bicarbonate water and pectin were combined. The mixture was slowly heated with stirring to the boiling point (105°C) and, with good agitation, the calcium chloride solution was added. The mixture was reheated to 105°C, the strawberry fruit added and heating continued with stirring (to prevent scorching) until a temperature of 104-105°C was reached. The mixture was removed from heat, the acid and artificial sweeteners solution were added with thorough mixing, and the preserve allowed to cool to 80-90°C. It was transferred to jars, tightly capped and cooled to ambient temperature for storage.

EXAMPLE 8

Vanilla Cake

A typical control cake (1) was prepared using the following ingredients and procedure:

Ingredients	Weight %
Emulsified shortening	15.71
Non-fat milk solids	1.63
Sugar (sucrose)	27.78
Whole eggs (beaten)	11.44
Water	14.91
Cake flour	27.82
Sodium bicarbonate	0.19
Glucono delta lactone	0.38
Vanilla extract	0.14
	100.00

Procedure:

In an electric home mixer bowl, the shortening, non-fat milk solids and sugar were creamed at low speed for 3 minutes. The eggs were added and the mixture was beaten for 2 minutes. The water and vanilla extract were combined and added to the above, and the resulting mixture was mixed for 2-3 minutes until a homogeneous creamy slurry was obtained. Meanwhile the cake flour, sodium bicarbonate and glucono delta lactone were premixed and added to the other hydrated ingredients. The resulting mixture was mixed 2-3 minutes until a batter of smooth and creamy consistency was obtained. A portion of this batter (450 grams) was poured into a 8 x 1.5 inch lightly greased round cake pan, and then baked at 177°C for 30 minutes.

A synthetically sweetened cake (2) was prepared in which all the sucrose was replaced by an equal weight of polydextrose, a non-caloric and non-sweet water soluble sugar replacement. A mixture containing 6% CP-54,802 and 94% AS-K was used to provide the sweetness to the cake. The ingredients used were as follows:

Ingredients	Weight %
Emulsified shortening	15.100
Non-fat milk solids	1.630
Whole eggs (beaten)	11.440
Polydextrose	27.683
CP-54,802	0.006
AS-K	0.091
Water	15.000
Cake flour	27.510
Sodium bicarbonate	0.540
Glucono delta lactone	0.860
Vanilla extract	0.140
	100.000

The procedure for making cake (2) was the same as for the control, except the AS-K and CP-54,802 were dissolved in the water prior to combining with the vanilla and adding to the mixture.

Taste comparison of the resulting cakes indicated them to display essentially equivalent sweetness intensity and quality as judged by texture, color, and other general physical attributes.

EXAMPLE 9

Hard Candies

Mint flavored sugarless hard candies were made by replacing 100% of the sugar in a standard recipe with polydextrose and a mixture containing 6% CP-54,802 and 94% AS-K, using the following proportions of ingredients and according to the direction given below.

Ingredients	Percent	Part
Polydextrose	68.590	A
Water	28.320	
Sodium bicarbonate	1.030	B
Titanium dioxide	0.490	
FD&C mint color, 10% solution[1]	0.060	
Water	0.500	
Artificial sweetener mixture containing 6% CP-54,802 and 94% AS-K	0.196	C
Water	0.800	
Peppermint flavor #US 48994[2]	0.007	
Spearmint flavor #H 6174,[2] 25% solution in propylene glycol	0.007	
	100.000	

[1] 75 parts of FD&C yellow #5, 10% solution, 25 parts of FD&C blue #1, 10% solution.

[2] Haarmann and Reimer Corporation.

Procedure:

1. Prepare a large stock each of part B and C mixtures, respectively, and set aside.
2. Add polydextrose to water, and heat while stirring until dissolved. Heat to 140-145°C at atmospheric pressure.
3. Remove from heat, and add pre-blended ingredients of part B with good stirring until mass puffs up and ingredients are mixed uniformly.
4. Introduce pre-blended ingredients of part C with good stirring.
5. Pour into molds or stamp using conventional laboratory candy equipment.

CLAIMS FOR ALL DESIGNATED STATES EXCEPT AT

1. An artificially sweetened composition for oral use which comprises 0.5 to 20 parts by weight of 3-(L-aspartyl-D-alaninamido)-2,2,4,4-tetramethyl-thietane or an edible salt thereof and 80 to 99.5 parts by weight of 6-methyl-1,2,3-oxathiazine-4(3H)-one-2,2-dioxide or an edible cationic salt thereof, the sum of the parts by weight equalling 100, in total amounts which produce the desired sweetness in said composition.

2. A composition of claim 1 which is an edible food or beverage.

3. A composition of claim 2 wherein the edible food is a confection or chewing gum.

4. A composition of claim 2 wherein the edible food or beverage is a flavored carbonated or non-carbonated drink, or dry mix for a non-carbonated drink.

5. A composition of claim 2 wherein the food or beverage is a canned or preserved fruit or fruit juice, a gelatin dessert or a pudding, or a dry mix for a gelatin dessert or pudding.

6. A composition of claim 2 wherein the edible food is a cake, cookie or other baked product.

7. A composition of claim 1 which is a liquid or dry powder suitable for use as a table sweetener.

8. A composition of claim 1 which is an oral hygienic product.

9. A composition of claim 1 which is a formulated medicinal agent.

10. An artificial sweetening composition suitable for use in the manufacture of a material for oral use which comprises 0.5 to 20 parts by weight of 3-(L-aspartyl-D-alaninamido)-2,2,4,4-tetramethylthietane or an edible salt thereof and 80 to 99.5 parts by weight of 6-methyl-1,2,3-oxathiazine-4(3H)-one-2,2-dioxide or an edible cationic salt thereof, said parts by weight

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CLAIMS FOR AT

1. A process for preparing an artificially sweetened composition for oral use which comprises combining 0.5 to 20 parts by weight of 3-(L-aspartyl-D-alaninamido)-2,2,4,4-tetramethylthietane or an edible salt thereof and 80 to 99.5 parts by weight of 6-methyl-1,2,3-oxathiazine-4(3H)-one-2,2-dioxide or an edible cationic salt thereof, the sum of the parts by weight equalling 100, in total amounts which produce the desired sweetness in said composition.

2. A process of claim 1 for a composition which is an edible food or beverage.

3. A process of claim 2 for a composition wherein the edible food is a confection or chewing gum.

4. A process of claim 2 for a composition wherein the edible food or beverage is a flavored carbonated or non-carbonated drink, or dry mix for a non-carbonated drink.

5. A process of claim 2 for a composition wherein the food or beverage is a canned or preserved fruit or fruit juice, a gelatin dessert or a pudding, or a dry mix for a gelatin dessert or pudding.

6. A process of claim 2 for a composition wherein the edible food is a cake, cookie or other baked product.

7. A process of claim 1 for a composition which is a liquid or dry powder suitable for use as a table sweetener.

8. A process of claim 1 for a composition which is an oral hygienic product.

9. A process of claim 1 for a composition which is a formulated medicinal agent.

10. A process for preparing artificial sweetening composition suitable for use in the manufacture of a material for oral use which comprises combining 0.5 to 20 parts by weight of 3-(L-aspartyl-D-alaninamido)-2,2,4,4-tetramethylthietane or an edible salt thereof and 80 to 99.5 parts by weight of 6-methyl-1,2,3-oxathiazine-4(3H)-one-2,2-dioxide or an edible cationic salt thereof, said parts by weight totalling 100.